

CHAPTER IV

SUMMARY OF TROPICAL CYCLONES OF 1964

The JTWC issued a total of 730 tropical warnings on 26 typhoons, 14 tropical storms and 5 tropical depressions in the Western Pacific Ocean in 1964. Seven additional tropical cyclones were investigated but did not intensity enough to substantiate the issuance of warnings. The development of 26 typhoons in the Western Pacific Ocean during 1964 is a new record. The previous record of 24 typhoons was established in 1962.

The following data for the JTWC area of responsibility is presented for comparison:

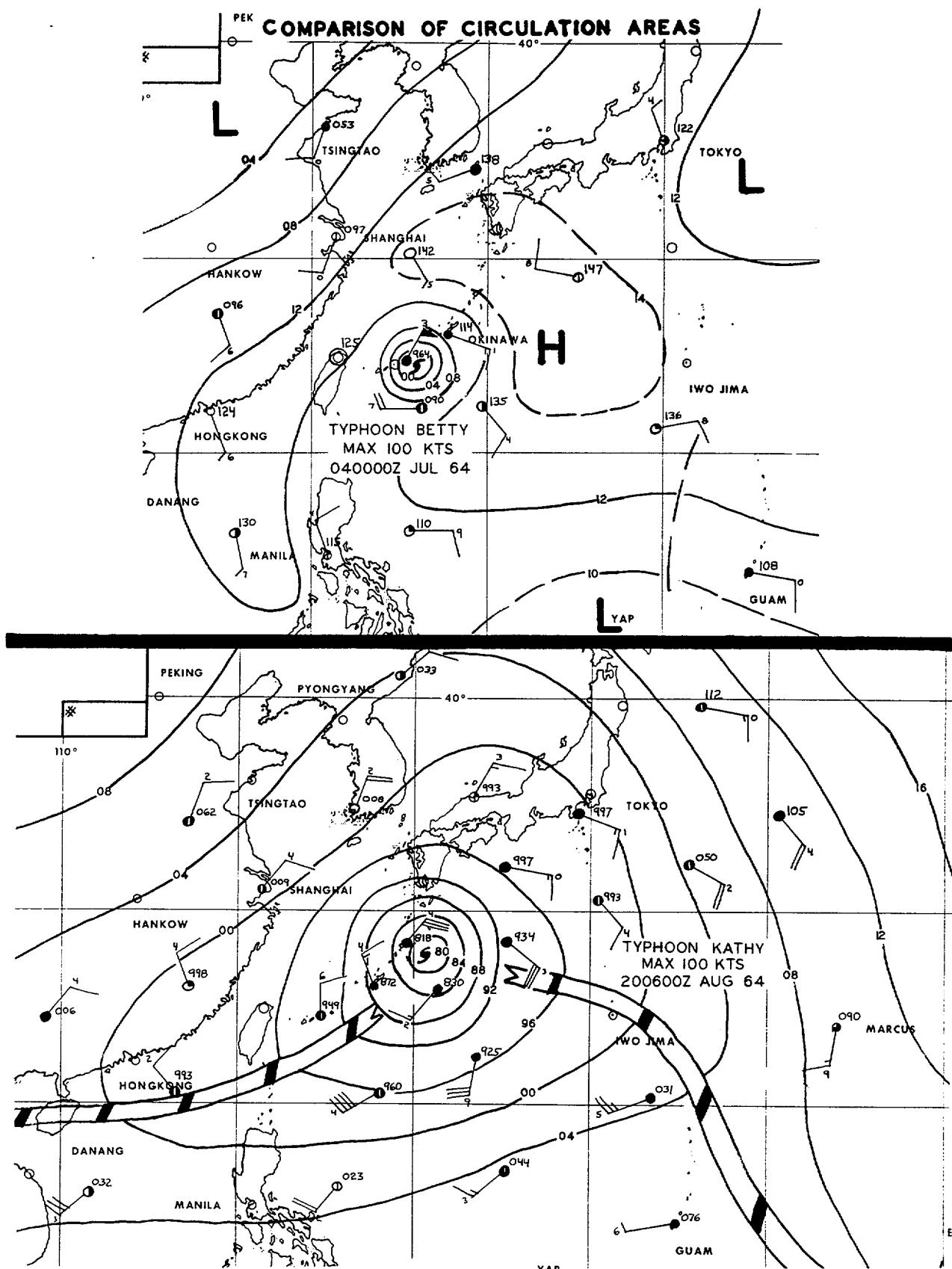
COMPARATIVE WESTERN PACIFIC TROPICAL CYCLONE DATA

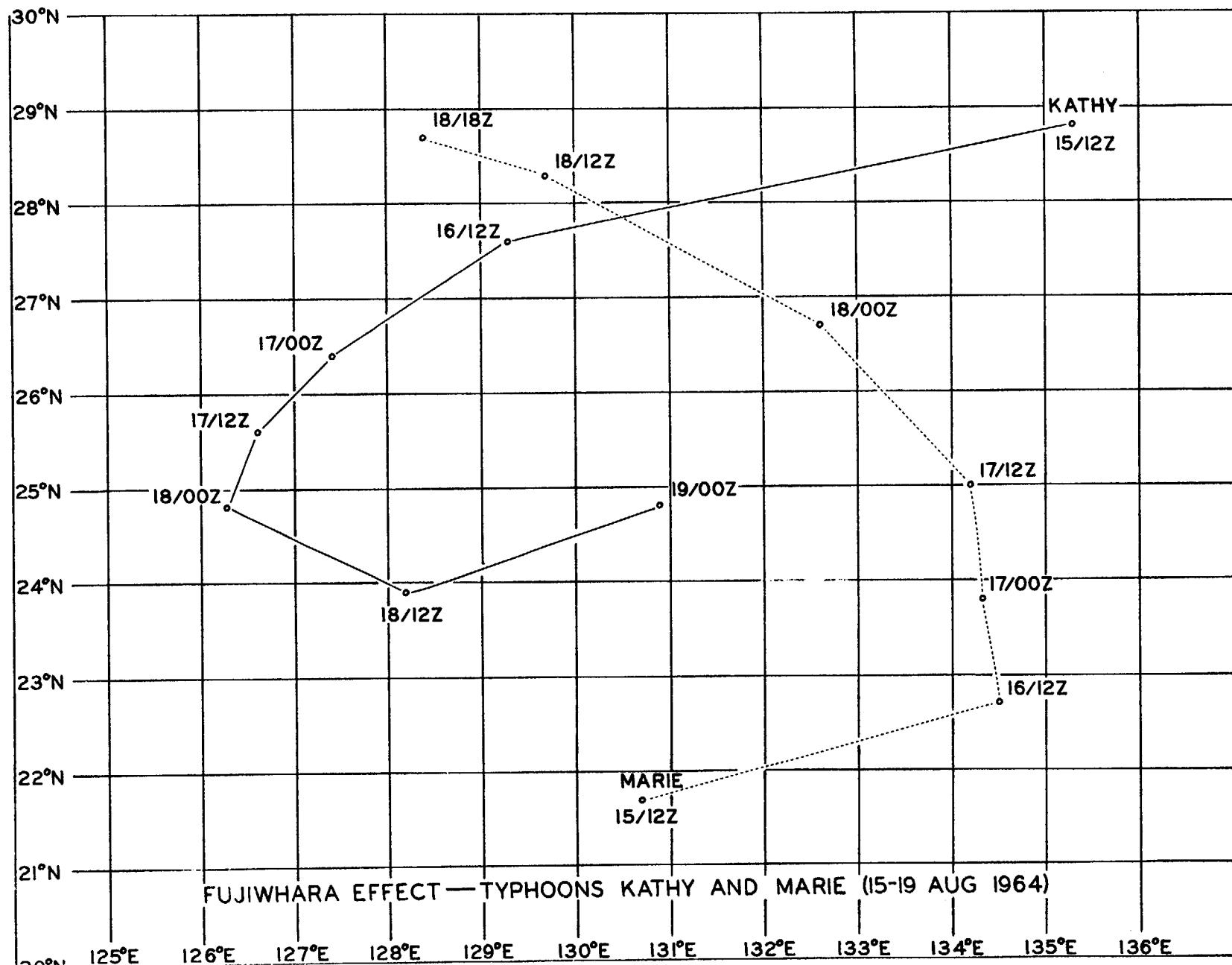
	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>
TOTAL NUMBER OF WARNINGS	776	738	815	663	730
CALENDAR DAYS OF WARNINGS	157	165	154	146	153
SUSPECT CYCLONES	26	27	15	5	7
TROPICAL DEPRESSIONS	3	11	9	3	5
TROPICAL STORMS	8	11	6	6	14
TYPHOONS	19	20	24	19	26
TOTAL TROPICAL CYCLONES	56	69	56	33	52

In the area of responsibility of the Joint Hurricane Warning Center, Hawaii, (North Pacific Ocean between 140°W and 180°) there were no cyclones which required tropical warnings.

The two most intense typhoons of 1964 were SALLY (03 Sep - 10 Sep) and OPAL (09 Dec - 16 Dec). Both had maximum sustained surface winds of 170 knots. These typhoons are classed as "super typhoons" (maximum surface winds in excess of 130 knots). Other typhoons in this class during 1964 were Typhoons CORA (06 Jul - 10 Jul), IDA (02 Aug - 09 Aug), WILDA (19 Sep - 25 Sep), and LOUISE (15 Nov - 20 Nov).

The circulation area of a tropical cyclone differs from system to system. As evidence of this fact, Typhoons BETTY (02 Jul - 06 Jul) and KATHY (12 Aug - 25 Aug) are depicted in the accompanying chart. Typhoon OPAL had the largest cyclonic surface circulation with a maximum radius of 650 miles. Typhoon ALICE (26 Jun - 28 Jun) was the smallest typhoon of 1964 with a maximum radius of 200 miles.





Typhoons KATHY, OPAL, TILDA, TESS and KATE performed cyclonic loops at some point during their lives. KATHY was the star performer when she executed a second minor loop while undergoing the first loop south of Japan. In a normal year a maximum of two or three typhoons can be expected to loop.

A classic example of the Fujiwhara Effect was observed between Typhoons KATHY and MARIE during the period 15 August through 18 August. KATHY became the predominate system and absorbed MARIE early on 19 August.

Another phenomenon noted during this record year was the rapid dissipation or disappearance of typhoons. Several typhoons, notably ALICE, ELSIE, and CORA, were observed by reconnaissance aircraft to have all the characteristics of a full blown typhoon and then within a matter of just a few hours to dissipate into a weak tropical low. There was no apparent reason for this rapid degeneration and no parameters have yet been established for forecasting it.

Of the 26 typhoons during the 1964 season, 15 dissipated over land, 5 dissipated over water, 2 were absorbed by other typhoons and only 4 became extratropical. (Characteristics of a tropical system becoming extratropical are covered in the 1963 Annual Typhoon Report.)

The South China Sea area saw "more than normal" typhoon activity in 1964. For the years 1959 through 1963, there were an average of 3.2 typhoons that traveled through the area west of the Philippines and south of 18.5°N (roughly the northern tip of Luzon). This compares to 10 typhoons in the same area in 1964.

Land areas affected by typhoons during the 1964 season are listed below:

Babuyan Islands.....SALLY and RUBY
Bataan Island.....TILDA
Bonin Islands.....KATHY and HOPE
Caroline Islands.....OPAL, IDA and CORA
China Mainland.....VIOLA, SALLY, RUBY, IDA, FLOSSIE,
BETTY and DOT

Hainan Islands.....	TILDA, WINNIE and CLARA
Hong Kong.....	VIOLA, SALLY, RUBY, IDA and DOT
Japan.....	MARIE, KATHY, WILDA and HELEN
Korea.....	HELEN, FLOSSIE and BETTY
Manchuria.....	HELEN
Marcus Island.....	TESS
Marianas Islands.....	ALICE, SALLY and TESS
Palau Island.....	OPAL, LOUISE and DOT
Philippine Islands.....	SALLY, RUBY, OPAL, IDA, ELSIE, CORA, WINNIE, LOUISE, DOT and CLARA
Ryukyu Islands.....	KATHY, FLOSSIE and BETTY
Vietnam.....	IRIS, VIOLET, TILDA, WINNIE and KATE
Volcano Islands.....	HELEN

The 24, 48 and 72-hour mean forecast error for each typhoon was computed by two methods. In addition to the standard mean vector forecast error table shown below, a computation of closest-distance error from best track has been included for comparison. This error computation is based on the closest right angle distance of the forecast position to the best track without regard to time. Possibly this will give the user a better understanding of the ability of JTWC to forecast the effects of a typhoon on one particular area.

The following tabulation of the forecast vector error for the past 15 years is given for comparison:

FORECAST VERIFICATION
AVERAGE ERROR NAUTICAL MILES

	24 HR	48 HR	72 HR
1950-58	170	---	---
1959	117	267	---
1960	177	354	---
1961	136	274	---
1962	144	287	476
1963	127	246	374
1964	133	284	429

1964 FORECAST VECTOR ERRORS*

TYphoon	24 HR FORECASTS		48 HR FORECASTS		72 HR FORECASTS	
	No. of Cases	Mean Error	No. of Cases	Mean Error	No. of Cases	Mean Error
TESS	18	212	14	476	3	924
VIOLA	8	178	4	402	0	--
WINNIE	21	133	17	270	4	510
ALICE	0	--	0	--	0	--
BETTY	14	134	10	312	0	--
CORA	11	89	7	152	0	--
DORIS	11	151	7	298	1	480
ELSIE	9	108	5	213	1	346
FLOSSIE	11	58	7	121	1	332
HELEN	24	94	20	204	8	390
IDA	22	112	18	212	6	278
KATHY	50	180	45	423	17	663
MARIE	6	220	2	396	0	--
RUBY	14	117	10	157	0	--
SALLY	26	95	20	155	8	236
TILDA	33	139	22	357	0	--
VIOLET	1	108	--	--	0	--
WILDA	20	110	16	183	6	239
CLARA	19	100	15	176	4	166
DOT	25	148	21	336	4	657
HOPE	19	185	15	534	0	--
IRIS	5	88	1	38	0	--
JOAN	6	47	2	87	0	--
KATE	11	178	7	298	0	--
LOUISE	16	79	10	68	2	55
OPAL	24	123	20	227	8	320

AVERAGE ERROR - 24 HR FORECASTS (424 CASES) ... 133MI

AVERAGE ERROR - 48 HR FORECASTS (315 CASES) ... 284MI

AVERAGE ERROR - 72 HR FORECASTS (73 CASES) ... 429MI

*Includes Forecast Vector errors during tropical storm intensity
as well as typhoon intensity

1964 FORECAST VECTOR ERRORS
(TYPHOON INTENSITY ONLY)

TYPHOON	24 HR FORECASTS		48 HR FORECASTS		72 HR FORECASTS	
	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR
TESS	13	178	9	455	1	1135
VIOLA	5	175	1	382	0	--
WINNIE	19	126	15	251	4	510
ALICE	0	--	0	--	0	--
BETTY	13	135	9	287	0	--
CORA	10	85	6	148	0	--
DORIS	5	140	1	242	0	--
ELSIE	5	94	1	255	0	--
FLOSSIE	10	43	6	96	0	--
HELEN	19	85	15	203	5	270
IDA	19	106	15	193	5	294
KATHY	40	191	35	461	13	750
MARIE	4	233	0	--	0	--
RUBY	13	107	9	149	0	--
SALLY	25	96	19	162	8	236
TILDA	21	133	16	343	0	--
VIOLET	0	--	0	--	0	--
WILDA	20	110	16	183	6	239
CLARA	16	78	12	137	4	166
DOT	17	147	13	424	2	1032
HOPE	7	219	3	518	0	--
IRIS	2	62	0	--	0	--
JOAN	2	55	0	--	0	--
KATE	6	138	2	277	0	--
LOUISE	14	65	8	59	1	68
OPAL	19	104	15	197	5	285

AVERAGE ERROR - 24 HR FORECASTS (324 CASES).... 123MI
 AVERAGE ERROR - 48 HR FORECASTS (226 CASES).... 267MI
 AVERAGE ERROR - 72 HR FORECASTS (54 CASES).... 431MI

1964 FORECAST ERRORS*
(IN TERMS OF CLOSEST DISTANCE TO BEST TRACK)

TYPHOON	24 HR FORECASTS		48 HR FORECASTS		72 HR FORECASTS	
	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR
TESS	18	72	14	126	3	267
VIOLA	8	121	4	309	--	--
WINNIE	21	114	17	238	4	405
ALICE	0	--	0	--	0	--
BETTY	14	103	10	253	0	--
CORA	11	53	7	87	0	--
DORIS	11	111	7	212	1	336
ELSIE	9	51	5	133	1	176
FLOSSIE	11	21	7	30	1	8
HELEN	24	74	20	167	8	285
IDA	22	54	18	104	6	131
KATHY	50	100	45	165	17	220
MARIE	6	201	2	380	0	--
RUBY	14	97	10	104	0	--
SALLY	26	43	20	59	8	93
TILDA	33	61	22	208	0	--
VIOLET	1	55	0	--	0	--
WILDA	20	79	16	140	6	188
CLARA	19	47	15	84	4	111
DOT	25	90	21	236	4	499
HOPE	19	115	15	246	0	--
IRIS	5	80	1	07	0	--
JOAN	6	14	2	13	0	--
KATE	11	92	7	188	0	--
LOUISE	16	55	10	46	2	28
OPAL	24	98	20	180	8	256

AVERAGE ERROR - 24 HR FORECASTS (424 CASES).... 80MI

AVERAGE ERROR - 48 HR FORECASTS (315 CASES).... 160MI

AVERAGE ERROR - 72 HR FORECASTS (73 CASES).... 221MI

*Includes Forecast errors during tropical storm intensity as well as typhoon intensity

1964 FORECAST ERRORS (TYPHOON INTENSITY ONLY)
(IN TERMS OF CLOSEST DISTANCE TO BEST TRACK)

TYPHOON	24 HR FORECASTS		48 HR FORECASTS		72 HR FORECASTS	
	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR	NO. OF CASES	MEAN ERROR
TESS	13	41	9	75	1	133
VIOLA	5	109	1	295	0	--
WINNIE	19	105	15	217	4	510
ALICE	0	--	0	--	0	--
BETTY	13	135	9	287	0	--
CORA	10	53	6	82	0	--
DORIS	5	140	1	242	0	--
ELSIE	5	45	1	184	0	--
FLOSSIE	10	17	6	31	0	--
HELEN	19	62	15	158	5	154
IDA	19	49	15	101	5	120
KATHY	40	108	35	192	13	264
MARIE	4	214	0	--	0	--
RUBY	13	85	9	93	0	--
SALLY	25	42	19	61	8	93
TILDA	21	52	16	207	0	--
VIOLET	0	--	0	--	0	--
WILDA	20	79	16	140	6	188
CLARA	16	52	12	85	4	111
DOT	17	107	13	343	2	911
HOPE	7	94	3	98	0	--
IRIS	2	40	0	--	0	--
JOAN	2	23	0	--	0	--
KATE	6	82	2	240	0	--
LOUISE	14	38	8	36	1	28
OPAL	19	79	15	135	5	202

AVERAGE ERROR - 24 HR FORECAST (324 CASES).... 76 MI.
 AVERAGE ERROR - 48 HR FORECAST (226 CASES).... 153 MI.
 AVERAGE ERROR - 72 HR FORECAST (54 CASES).... 225 MI.

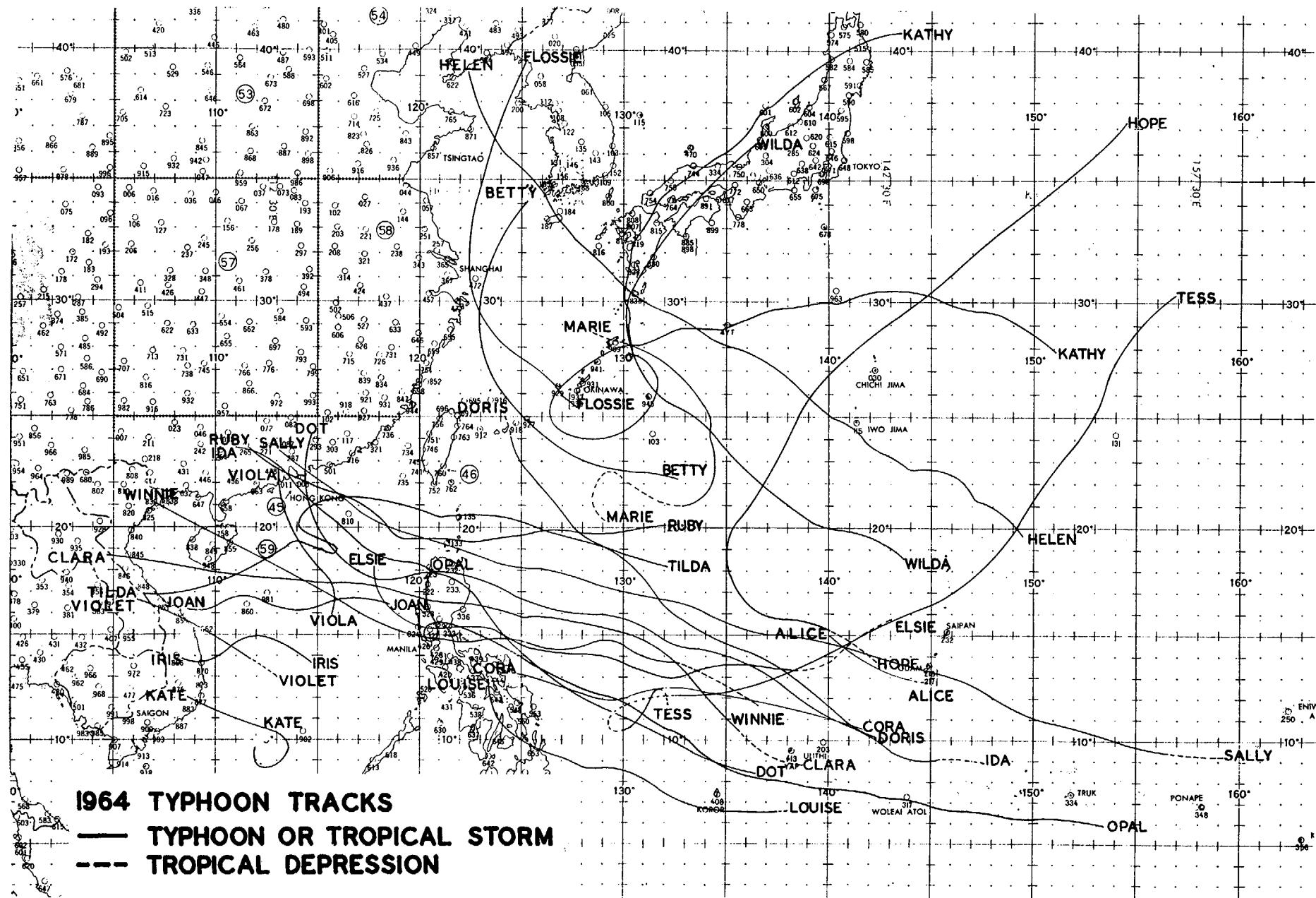
DISTANCE BETWEEN OPERATIONAL WARNING
POSITS AND BEST TRACK POSITS

<u>TYPHOON</u>	<u>CASES</u>	<u>AVERAGE</u>	<u>MAX</u>	<u>MIN</u>
TESS	26	39	145	05
VIOLA	12	36	74	05
WINNIE	21	27	76	05
ALICE	4	11	24	06
BETTY	18	20	68	00
CORA	15	18	48	05
DORIS	15	27	92	03
ELSIE	13	32	80	05
FLOSSIE	15	12	30	03
HELEN	28	22	121	03
IDA	26	19	70	05
KATHY	54	18	100	00
MARIE	10	38	105	03
RUBY	18	35	82	06
SALLY	30	27	204	02
TILDA	37	18	70	00
VIOLET	5	23	48	09
WILDA	24	20	142	00
CLARA	23	28	172	00
DOT	29	27	202	03
HOPE	23	42	113	00
IRIS	9	16	40	05
JOAN	10	26	90	05
KATE	15	80	367*	05
LOUISE	20	29	113	00
OPAL	28	20	87	00
AVERAGE	510	26MI	106MI	03MI

*Data received after warning time indicated development of a center other than that center described in the warning. This necessitated a relocation of the storm.

1964 TYPHOON DATA SUMMARY

TYPHOON	MONTH	FROM WARNINGS		
		MAX RADIUS 100KT WND	MAX RADIUS 50KT WND	MAX RADIUS 30KT
TESS	MAY	100	175	400
VIOLA	MAY	---	100	400
WINNIE	JUN-JUL	---	200	500
ALICE	JUN	---	25	200
BETTY	JUL	30	100	200
CORA	JUL	30	100	200
DORIS	JUL	---	75	200
ELSIE	JUL	30	75	150
FLOSSIE	JUL	---	100	300
HELEN	JUL-AUG	75	150	350
IDA	AUG	80	250	600
KATHY	AUG	30	150	500
MARIE	AUG	---	100	300
RUBY	SEP	25	100	200
SALLY	SEP	70	125	300
TILDA	SEP	40	125	500
VIOLET	SEP	---	50	150
WILDA	SEP	50	200	600
CLARA	OCT	---	150	250
DOT	OCT	70	175	350
HOPE	OCT	100	250	500
IRIS	NOV	---	50	450
JOAN	NOV	---	100	500
KATE	NOV	50	200	450
LOUISE	NOV	50	300	450
OPAL	DEC	120	250	500
<hr/>		AVERAGE	59MI	141MI
<hr/>				365MI



1964 TYPHOONS

MAX SFC MIN OBS MAX RADIUS CALENDAR DAYS OF DISTANCE
 NAME DATE WND SLP SFC CIRC WARNINGS/TYPHOONS TRAVELED

NAME	DATE	WND	SLP	SFC	CIRC	WARNINGS/TYPHOONS	DISTANCE
TESS	14MAY-22MAY	85	965	600		8.75	3.00
VIOLA	25MAY-28MAY	70	980	450		3.00	1.00
WINNIE	26JUN-03JUL	100	950	475		6.25	4.50
ALICE	26JUN-28JUN	65	990	200		1.50	0.50
BETTY	02JUL-06JUL	110	958	225		4.75	3.75
CORA	06JUL-10JUL	140	967	325		4.00	3.00
DORIS	11JUL-15JUL	80	974	350		4.25	1.25
ELSIE	13JUL-18JUL	100	992	350		5.25	1.25
FLOSSIE	26JUL-29JUL	80	974	300		4.75	3.00
HELEN	27JUL-03AUG	130	931	450		7.00	4.75
IDA	02AUG-09AUG	135	927	575		7.25	4.75
KATHY	12AUG-25AUG	115	945	850		13.50	10.00
MARIE	14AUG-18AUG	70	976	325		4.75	1.00
RUBY	01SEP-05SEP	120	963	400		4.50	3.25
SALLY	03SEP-10SEP	170	894	425		8.00	6.50
TILDA	13SEP-22SEP	110	952	500		9.50	5.75
VIOLET	14SEP-15SEP	75	---	325		1.75	0.50
WILDA	19SEP-25SEP	150	905	675		6.25	5.50
CLARA	02OCT-08OCT	80	979	525		6.50	4.00
DOT	06OCT-13OCT	90	976	400		7.50	4.25
HOPE	23OCT-29OCT	130	973	650		6.00	1.75
IRIS	02NOV-04NOV	65	994	400		2.25	0.50
JOAN	06NOV-08NOV	70	999	325		4.50	0.50
KATE	13NOV-16NOV	80	986	375		4.00	1.50
LOUISE	15NOV-20NOV	165	914	500		6.00	4.25
OPAL	08DEC-16DEC	170	903	650		7.75	5.75
	AVERAGE	105KTS	959MB	447MI		5.75	3.30
							1471MI

65

TROPICAL CYCLONES OF 1964

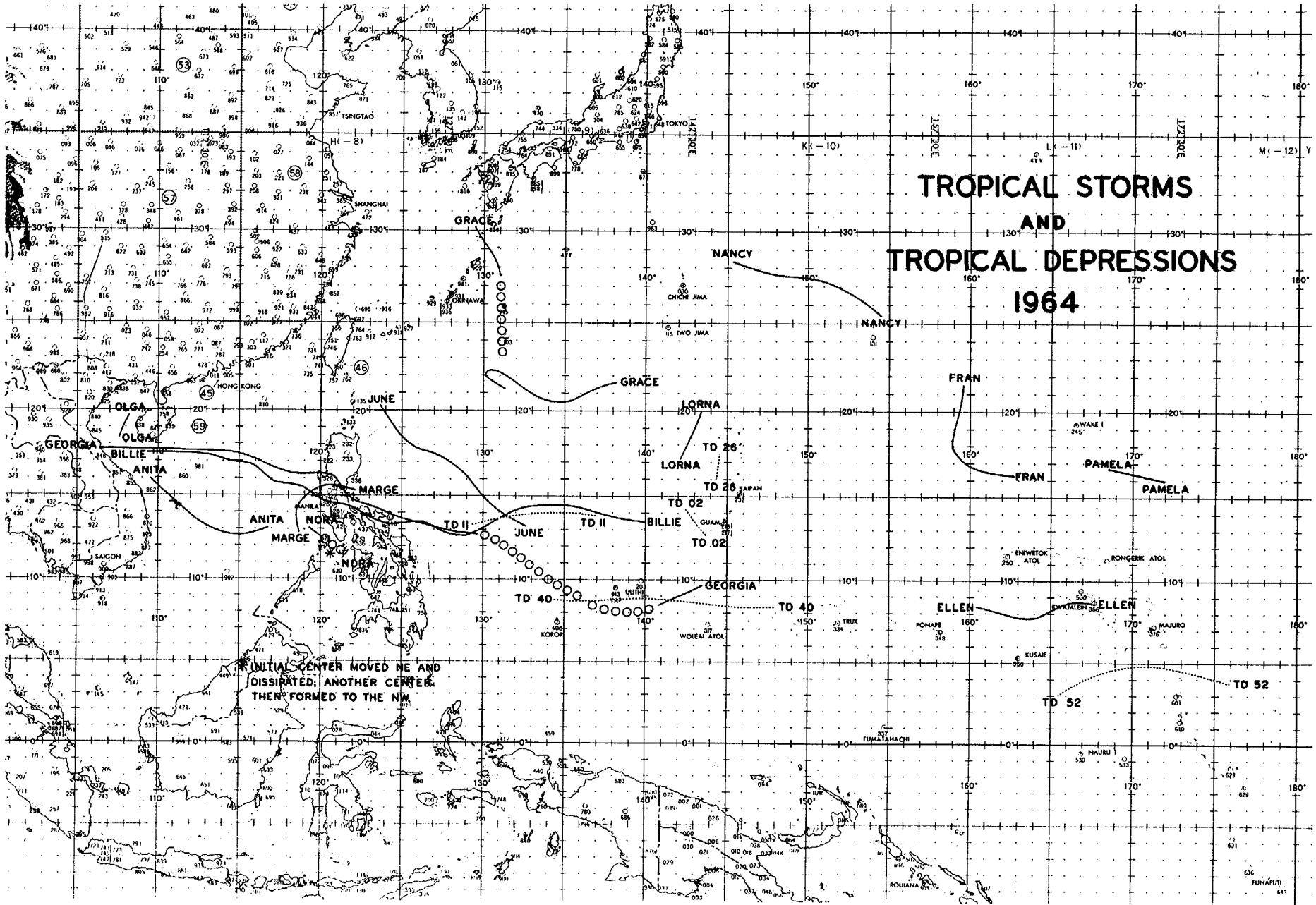
<u>CYCLONE</u>	<u>*PERIOD</u>
01. Typhoon TESS	14 MAY - 22 MAY
02. Tropical Depression	16 MAY - 18 MAY
03. Typhoon VIOLA	25 MAY - 28 MAY
04. Typhoon WINNIE	26 JUN - 03 JUL
05. Typhoon ALICE	26 JUN - 28 JUN
06. Investigation	29 JUN - 02 JUL
07. Typhoon BETTY	02 JUL - 06 JUL
08. Typhoon CORA	06 JUL - 10 JUL
09. Typhoon DORIS	11 JUL - 15 JUL
10. Typhoon ELSIE	13 JUL - 18 JUL
11. Tropical Depression	21 JUL - 23 JUL
12. Typhoon FLOSSIE	26 JUL - 29 JUL
13. Tropical Storm GRACE	26 JUL - 30 JUL
14. Typhoon HELEN	27 JUL - 03 AUG
15. Typhoon IDA	02 AUG - 09 AUG
16. Tropical Storm GRACE**	03 AUG - 04 AUG
17. Tropical Storm JUNE	10 AUG - 13 AUG
18. Tropical Storm LORNA	12 AUG - 13 AUG
19. Typhoon KATHY	12 AUG - 25 AUG
20. Typhoon MARIE	14 AUG - 18 AUG
21. Tropical Storm NANCY	17 AUG - 19 AUG
22. Tropical Storm OLGA	24 AUG - 25 AUG
23. Investigation	25 AUG
24. Tropical Storm PAMELA	25 AUG - 26 AUG
25. Typhoon RUBY	01 SEP - 05 SEP
26. Tropical Depression	02 SEP - 03 SEP
27. Typhoon SALLY	03 SEP - 10 SEP
28. Investigation	07 SEP
29. Typhoon TILDA	13 SEP - 22 SEP
30. Typhoon VIOLET	14 SEP - 15 SEP

TROPICAL CYCLONES OF 1964 (CONT'D)

<u>CYCLONE</u>	<u>*PERIOD</u>
31. Investigation	15 SEP
32. Typhoon WILDA	19 SEP - 25 SEP
33. Tropical Storm ANITA	24 SEP - 26 SEP
34. Tropical Storm BILLIE	25 SEP - 01 OCT
35. Typhoon CLARA	02 OCT - 08 OCT
36. Typhoon DOT	06 OCT - 13 OCT
37. Tropical Storm ELLEN	08 OCT - 13 OCT
38. Tropical Storm FRAN	15 OCT - 17 OCT
39. Tropical Storm GEORGIA	17 OCT - 24 OCT
40. Tropical Depression	20 OCT - 24 OCT
41. Typhoon HOPE	23 OCT - 29 OCT
42. Investigation	30 OCT - 04 NOV
43. Typhoon IRIS	02 NOV - 04 NOV
44. Typhoon JOAN	06 NOV - 08 NOV
45. Typhoon KATE	13 NOV - 16 NOV
46. Typhoon LOUISE	15 NOV - 20 NOV
47. Investigation	19 NOV - 20 NOV
48. Tropical Storm MARGE	21 NOV - 23 NOV
49. Tropical Storm NORA	27 NOV - 28 NOV
50. Investigation	05 DEC
51. Typhoon OPAL	09 DEC - 16 DEC
52. Tropical Depression	10 DEC - 12 DEC

* The period shown covers the period from the date the cyclone was first assigned a cyclone number until the final warning was issued, or if no warnings were issued, the date the cyclone dissipated.

**Tropical storm Grace dissipated on 30 July and on 03 August reformed north of the 30 July position.



TROPICAL STORMS AND TROPICAL DEPRESSIONS 1964

TROPICAL STORMS 1964
POSITION DATA

TROPICAL STORM GRACE
26 JUL-29 JUL

DTG	LAT	LONG	DTG	LAT	LONG
261200Z	21.7N	138.2E	280000Z	21.6N	132.3E
261800Z	21.4N	137.3E	280600Z	22.3N	131.2E
270000Z	21.1N	136.5E	281200Z	21.9N	130.6E
270600Z	20.7N	135.7E	281800Z	21.6N	130.8E
271200Z	20.5N	134.6E	290000Z	21.4N	131.0E
271800Z	20.8N	133.3E	290600Z	21.2N	131.3E
			03 AUG		
030000Z	27.6N	131.0E	031200Z	29.4N	130.1E
030600Z	28.5N	130.7E	031800Z	30.2N	129.5E

TROPICAL STORM JUNE
10 AUG-13 AUG

DTG	LAT	LONG	DTG	LAT	LONG
100600Z	13.3N	132.7E	111800Z	17.4N	127.0E
101200Z	13.8N	131.6E	120000Z	17.9N	125.9E
101800Z	14.4N	130.7E	120600Z	18.5N	125.0E
110000Z	15.2N	129.8E	121200Z	19.1N	124.6E
110600Z	16.1N	129.1E	121800Z	19.7N	124.2E
111200Z	16.8N	128.1E	130000Z	20.2N	123.8E

TROPICAL STORM LORNA
12 AUG-13 AUG

DTG	LAT	LONG	DTG	LAT	LONG
120000Z	17.2N	142.0E	121800Z	19.3N	143.1E
120600Z	17.8N	142.4E	130000Z	20.1N	143.3E
121200Z	18.6N	142.8E			

TROPICAL STORMS 1964
POSITION DATA

TROPICAL STORM NANCY
17 AUG-19 AUG

DTG	LAT	LONG	DTG	LAT	LONG
170600Z	25.4N	154.5E	181200Z	27.1N	151.6E
171200Z	25.7N	154.2E	181800Z	27.6N	149.8E
171800Z	25.9N	153.8E	190000Z	27.8N	147.5E
180000Z	26.2N	153.4E	190600Z	29.4N	145.3E
180600Z	26.5N	152.8E			

TROPICAL STORM OLGA
23 AUG-24 AUG

DTG	LAT	LONG	DTG	LAT	LONG
231800Z	19.8N	108.3E	240600Z	18.9N	107.8E
240000Z	19.4N	108.0E	241200Z	18.4N	107.7E

TROPICAL STORM PAMELA
25 AUG-26 AUG

DTG	LAT	LONG	DTG	LAT	LONG
250000Z	16.0N	172.0E	251800Z	16.5N	169.4E
250600Z	16.2N	171.2E	260000Z	16.7N	168.5E
251200Z	16.4N	170.3E			

TROPICAL STORM ANITA
24 SEP-26 SEP

DTG	LAT	LONG	DTG	LAT	LONG
241200Z	13.1N	116.8E	251800Z	13.6N	112.4E
241800Z	12.9N	116.3E	260000Z	14.1N	111.8E
250000Z	12.8N	115.4E	260600Z	14.6N	111.2E
250600Z	12.8N	114.2E	261200Z	15.2N	110.5E
251200Z	13.2N	113.1E	261800Z	16.0N	109.6E

TROPICAL STORM BILLIE
25 SEP-30 SEP

DTG	LAT	LONG	DTG	LAT	LONG
251200Z	13.5N	140.0E	280600Z	12.8N	127.7E
251800Z	13.7N	138.8E	281200Z	13.5N	125.7E
260000Z	13.9N	137.7E	281800Z	13.5N	123.8E
260600Z	14.2N	136.5E	290000Z	14.3N	122.2E
261200Z	14.4N	135.3E	290600Z	14.8N	120.2E
261800Z	14.6N	134.2E	291200Z	15.8N	118.2E
270000Z	14.5N	132.9E	291800Z	16.2N	116.7E
270600Z	14.2N	131.9E	300000Z	16.9N	115.4E
271200Z	13.7N	131.1E	300600Z	17.2N	113.6E
271800Z	13.2N	130.2E	301200Z	17.5N	111.4E
280000Z	12.8N	129.2E	301800Z	17.6N	109.3E

TROPICAL STORM ELLEN
08 OCT-10 OCT

DTG	LAT	LONG	DTG	LAT	LONG
080000Z	08.6N	167.8E	090600Z	07.8N	163.9E
080600Z	08.8N	166.9E	091200Z	07.8N	163.1E
081200Z	08.6N	166.2E	091800Z	07.9N	162.3E
081800Z	08.3N	165.4E	100000Z	08.2N	161.4E
090000Z	08.0N	164.8E	100600Z	08.4N	160.5E

TROPICAL STORM FRAN
15 OCT-17 OCT

DTG	LAT	LONG	DTG	LAT	LONG
150600Z	16.2N	162.7E	161200Z	17.6N	159.2E
151200Z	16.3N	161.9E	161800Z	18.6N	158.9E
151800Z	16.5N	161.2E	170000Z	19.8N	159.3E
160000Z	16.7N	160.4E	170600Z	20.7N	159.5E
160600Z	17.1N	159.8E	171200Z	21.5N	159.7E

TROPICAL STORM GEORGIA

17 OCT-23 OCT

DTG	LAT	LONG	DTG	LAT	LONG
171200Z	09.8N	143.5E	211800Z	16.5N	117.6E
171800Z	09.1N	142.1E	220000Z	17.3N	115.8E
180000Z	08.5N	140.7E	220600Z	17.7N	114.0E
200000Z	12.8N	129.8E	221200Z	17.8N	112.3E
200600Z	13.0N	128.0E	221800Z	17.8N	111.0E
201200Z	13.3N	126.2E	230000Z	17.8N	109.8E
201800Z	13.9N	124.4E	230600Z	17.8N	108.6E
210000Z	14.6N	122.7E	231200Z	17.8N	107.5E
210600Z	16.2N	120.9E	231800Z	17.9N	106.3E
211200Z	16.3N	119.3E			

TROPICAL STORM MARGE

21 NOV-23 NOV

DTG	LAT	LONG	DTG	LAT	LONG
210000Z	15.3N	122.2E	220600Z	14.3N	118.5E
210600Z	15.6N	121.3E	221200Z	13.9N	118.5E
211200Z	15.6N	120.2E	221800Z	13.6N	118.5E
211800Z	15.3N	119.3E	230000Z	13.3N	118.6E
220000Z	14.7N	118.7E	230600Z	12.9N	118.7E

TROPICAL STORM NORA

27 Nov-28 NOV

DTG	LAT	LONG	DTG	LAT	LONG
270000Z	11.3N	121.3E	271800Z	12.8N	119.7E
270600Z	11.7N	121.6E	280000Z	13.2N	119.3E
271200Z	12.6N	120.1E			

TROPICAL DEPRESSIONS 1964
POSITION DATA

TROPICAL DEPRESSION ZERO TWO
16 MAY-17 MAY

DTG	LAT	LONG	DTG	LAT	LONG
161800Z	12.8N	143.8E	171200Z	13.7N	142.7E
170000Z	13.1N	143.4E	171800Z	14.2N	142.4E
170600Z	13.4N	143.0E			

TROPICAL DEPRESSION ONE ONE
21 JUL-22 JUL

DTG	LAT	LONG	DTG	LAT	LONG
211200Z	13.9N	137.0E	220600Z	13.8N	132.2E
211800Z	14.0N	135.3E	221200Z	13.6N	130.6E
220000Z	14.0N	133.7E	221800Z	13.4N	129.1E

TROPICAL DEPRESSION TWO SIX
02 SEP-03 SEP

DTG	LAT	LONG	DTG	LAT	LONG
020600Z	16.1N	144.4E	021800Z	17.0N	144.6E
021200Z	16.5N	144.5E	030000Z	17.5N	144.7E

TROPICAL DEPRESSION FOUR ZERO
20 OCT-24 OCT

DTG	LAT	LONG	DTG	LAT	LONG
201800Z	08.4N	148.0E	221200Z	08.9N	140.8E
210000Z	08.3N	147.0E	221800Z	08.9N	139.8E
210600Z	08.3N	145.9E	230000Z	08.9N	138.8E
211200Z	08.4N	144.9E	230600Z	08.9N	137.8E
211800Z	08.7N	143.9E	231200Z	08.9N	136.8E
220000Z	08.8N	142.9E	231800Z	08.9N	135.8E
220600Z	08.9N	141.9E	240000Z	08.9N	134.7E

TROPICAL DEPRESSIONS 1964
POSITION DATA

TROPICAL DEPRESSION FIVE TWO
10 DEC-12 DEC

DTG	LAT	LONG	DTG	LAT	LONG
101200Z	03.8N	176.0E	111200Z	04.8N	169.8E
101800Z	04.3N	174.5E	111800Z	04.5N	168.3E
110000Z	04.7N	172.9E	120000Z	03.9N	166.8E
110600Z	04.9N	171.4E	120600Z	03.0N	165.5E